

Application No. 10/823,844  
Filed: April 14, 2004  
TC Art Unit: 1723  
Confirmation No.: 5528

AMENDMENTS TO THE CLAIMS

1. (Original) A centrifugal separator, comprising:

a cylindrical bowl having a conical lower end with an opening through which feed liquid is injected during a feed mode of operation, the bowl being operative during the feed mode of operation to rotate at a high speed to separate the feed liquid into centrate and solids, the solids accumulating along the inner surface of the bowl; and

a piston assembly including a conical piston coupled to a piston actuator, the piston being disposed within the bowl in tight-fitting relationship with the inner surface thereof, the piston actuator being operative in a solids discharge mode of operation to urge the piston axially downward in the bowl to force the accumulated solids from the bowl via the opening in the conical lower end of the bowl.

2. (Original) A centrifugal separator according to claim 1, wherein the piston includes a centrate valve having an open position in the feed mode of operation and a closed position in the solids discharge mode of operation, the centrate valve being operative in the open position to permit the flow of the centrate from the bowl into a passage to a centrate discharge port of the separator, the centrate valve being operative in the closed position to block the passage of the accumulated solids from the bowl into the passage to the centrate discharge port.

3. (Original) A centrifugal separator according to claim 2, wherein the centrate valve is an annular member located at substantially the midsection of the piston.

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4. (Original) A centrifugal separator according to claim 2, wherein the piston is configured to bias the centrare valve in the closed position, the bowl includes a hub against which the piston is located during the feed mode of operation, and the hub and the piston are cooperatively configured such that the centrare valve is urged to the open position when the piston is located against the hub.

5. (Original) A centrifugal separator according to claim 4, wherein the piston includes one or more springs operative to bias the centrare valve in the closed position.

6. (Original) A centrifugal separator according to claim 4, wherein the hub includes one or more downward-extending pins, and the piston includes one or more openings through which the pins extend to the pins contact the centrare valve and maintain it in the open position when the piston is located against the hub.

7. (Original) A centrifugal separator according to claim 1, wherein the coupling between the piston and the piston actuator is operative to permit the piston to be held at an uppermost position in the bowl by hydraulic pressure from the feed liquid in the feed mode of operation.

8. (Original) A centrifugal separator according to claim 1, wherein the coupling between the piston and the piston actuator comprises:

a lower piston shaft extending upwardly from the piston and having a hollow upper portion;

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a hollow upper piston shaft having first and second positions with respect to the lower piston shaft, the first position being a disconnected position in which the upper piston shaft is withdrawn from the hollow portion of the lower piston shaft, the second position being a connected position in which the upper piston shaft is inserted within the hollow portion of the lower piston shaft and mechanically linked thereto, the upper piston shaft including a plurality of flexible, downward-extending fingers that in a relaxed position permit the upper piston shaft to slide with respect to the lower piston shaft;

a coupling lock draw bar disposed within the upper piston shaft, the coupling lock draw bar being configured at a lower end thereof to urge the fingers of the upper piston shaft outwardly against the internal wall of the lower piston shaft to lock the upper and lower piston shafts together when the coupling lock draw bar is urged upwardly with respect to the upper piston shaft; and

a mechanism at the upper end of the upper piston shaft operative to selectively apply an upward force on the coupling lock draw bar with respect to the upper piston shaft to mechanically link the upper and lower piston shafts together.

9. (Original) A centrifugal separator according to claim 8, wherein the force-applying mechanism comprises a coupling lock cylinder through which the coupling lock draw bar extends, the coupling lock cylinder including an actuatable piston operative in response to an actuating force to apply the upward force to the coupling lock draw bar.

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10. (Original) A centrifugal separator according to claim 9, wherein the actuating force is hydraulic.

11. (Original) A centrifugal separator according to claim 9, wherein the actuating force is pneumatic.

12. (New) A centrifugal separator, comprising:

a cylindrical bowl having a conical lower end with an opening through which feed liquid is injected during a feed mode of operation, the bowl being operative during the feed mode of operation to rotate at a high speed to separate the feed liquid into centrate and solids, the solids accumulating along the inner surface of the bowl; and

a piston assembly including a conical piston coupled to a piston actuator, the piston being disposed within the bowl in tight-fitting relationship with the inner surface thereof, the piston actuator being operative in a solids discharge mode of operation to urge the piston axially downward in the bowl to force the accumulated solids from the bowl via the opening in the conical lower end of the bowl, wherein the piston includes a centrate valve having an open position in the feed mode of operation and a closed position in the solids discharge mode of operation, the centrate valve being operative in the open position to permit the flow of the centrate from the bowl into a passage to a centrate discharge port of the separator, the centrate valve being operative in the closed position to block the passage of the accumulated solids from the bowl into the passage to the centrate discharge port.

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13. (New) A centrifugal separator, comprising:

a cylindrical bowl having a conical lower end with an opening through which feed liquid is injected during a feed mode of operation, the bowl being operative during the feed mode of operation to rotate at a high speed to separate the feed liquid into centrate and solids, the solids accumulating along the inner surface of the bowl; and

a piston assembly including a conical piston coupled to a piston actuator, the piston being disposed within the bowl in tight-fitting relationship with the inner surface thereof, the piston actuator being operative in a solids discharge mode of operation to urge the piston axially downward in the bowl to force the accumulated solids from the bowl via the opening in the conical lower end of the bowl, wherein the coupling between the piston and the piston actuator comprises

a lower piston shaft extending upwardly from the piston and having a hollow upper portion,

a hollow upper piston shaft having first and second positions with respect to the lower piston shaft, the first position being a disconnected position in which the upper piston shaft is withdrawn from the hollow portion of the lower piston shaft, the second position being a connected position in which the upper piston shaft is inserted within the hollow portion of the lower piston shaft and mechanically linked thereto, the upper piston shaft including a plurality of flexible, downward-extending fingers that in a relaxed position permit the upper piston shaft to slide with respect to the lower piston shaft,

a coupling lock draw bar disposed within the upper piston shaft, the coupling lock draw bar being configured at a lower end

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thereof to urge the fingers of the upper piston shaft outwardly against the internal wall of the lower piston shaft to lock the upper and lower piston shafts together when the coupling lock draw bar is urged upwardly with respect to the upper piston shaft, and

a mechanism at the upper end of the upper piston shaft operative to selectively apply an upward force on the coupling lock draw bar with respect to the upper piston shaft to mechanically link the upper and lower piston shafts together.